IEG/160-69
23 May 1969

MEMORANDUM FOR: Chief, Technical Services & Support Group, NPIC

SUBJECT: IEG Operational Suitability Evaluation of [redacted] 1540 Split Format Light Table

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1. The Imagery Exploitation Group has completed an Operational Suitability Evaluation of the prototype [redacted] 1540 Split Format Light Table. The following comments are submitted:

a. Light Source

(1) Luminance distribution on both stages is unacceptable due to a marked fall-off in the area of the split and around the edges.

(2) Flicker is evident on both stages at low illumination settings.

b. Film Drive - Control and positioning of film at slow slew speeds is poor. The electrical/mechanical handwheel is unacceptable because it will not control film movement to the extent required.

c. Optics Mounting System - The microscope carriage has a manual locking feature (knurled knob) for the "X" direction only. There is no provision for securing the carriage in the "Y" direction.

d. Human Factors

(1) The joystick (toggle switch) for electrical X-Y control of the microscope carriage is difficult to reach. The operation becomes tiresome after prolonged use since the operators left arm must remain raised to eye level.

(2) The correct position of the control switches for direction of film spool rotation (cw/ccw) is dependent upon whether film is threaded emulsion up or emulsion down, i.e., threading from the bottom or the top of the spool respectively. The Operators Manual, provided with the prototype table, has directions for emulsion down threading only. The setting of the control switches in this case are: right control box Clockwise (cw); left control box Counterclockwise (ccw). For emulsion up, the settings must be reversed or it will result in rapid unspooling of film from both sides onto the floor due to a lack of torque on the drive motors.

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(3) The control knobs (Potentiometer) for the motorized film drive speed are marked INCREASE and DECREASE, whereas they are in fact controls for DIRECTION and SPEED of film travel. Without a center or null region mark, the operator has no way of determining the direction of travel or rate of slew until he has turned on the motor power switch.

(4) Center personnel are required by regulation to turn off all electrical equipment which are not part of the building installation upon securing the working area. The prototype light table power ON-OFF switch also controls the coolant pre-heat circuit. Therefore, operators should not use the instrument for a period of time each day (20 to 30 minutes) until the pre-heat cycle is completed.

(5) The light source coolant expansion tanks are located in the back of the table. The requirement for periodic checks of the coolant levels considerably inconveniences the operator by causing him to walk around to the back of the table in order to view the level of fluid in the expansion tank. Additionally, when the coolant is cold, it is very difficult to ascertain the level of the fluid.

(6) The color of the OVER TEMP warning light is almost identical to the power ON-OFF indicator light. It is difficult to differentiate between the two.

(7) The metal guard panels located inside and adjacent to the lower film drive motors are potential hazards to the operators knees and clothing.

e. Table Elevation

(1) The motorized table elevating feature is non-essential. An operator will adjust the table elevation to the optimum for his height and will rarely adjust it thereafter. Also, it is difficult to manually adjust the table elevation by use of the hand crank due to gear ratio.

(2) Problems were encountered by some operators in their ability to look through the microscope eyepiece with the table set at the minimum elevation.

25X1 2. In IEG's opinion, the [redacted] 1540 Split Format Light Table will be an acceptable item when certain modifications are completed. The

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following modifications are cited as essential to the development of optimum equipment performance.

a. Light Source

(1) The light source must provide 3,000 foot-lamberts with a maximum variance of 15 percent between any two points on a single stage and within one inch of the edge of the illuminated surface in the area of the split as well as the front and back edges. This requirement is critical to maximum effectiveness of the equipment and operator performance.

(2) The evident flicker at the lower luminance ranges (from 100 foot-lamberts up) should be eliminated. This is required to minimize eye strain and operator fatigue.

b. Film Drive - It is recommended that the electrical/mechanical handwheel feature and its associated circuitry be removed. The motorized film control should be improved to provide positive film control for slow scanning rates.

c. Optics Mounting System - A manual lock should be added to secure the microscope carriage in the "Y" direction in addition to that already provided for the "X" direction. This will provide a safety feature when the equipment is being moved from one location to another.

d. Human Factors

(1) It is recommended that the control switches for X and Y microscope carriage movement be relocated. It is suggested that the ON-OFF switch, rate control knob and X-Y joystick be consolidated and relocated on the front of the left light box at the approximate position of the electrical/mechanical handwheel.

(2) The Operator's Manual should clearly state a caution to unlock both the X and Y manual locks on the microscope carriage prior to actuating the circuit for electrical control of the carriage. It should state that failure to do so can result in damage to the carriage and/oromotor.

(3) It is recommended that the Operator's Manual provide specific instructions for proper positioning of the control switches for direction of film spool rotation (cw/ccw) when the film is threaded emulsion up and emulsion down.

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In conjunction with this, it would be advisable to attach a plate with a spooling diagram on each control box. This guidance could preclude incorrect settings and inadvertant unspooling of film.

(4) The control knobs for the motorized film drive should be labled FILM TRANSPORT vice FILM SPEED and have a NULL region identified with an index on the knobs. The words INCREASE and DECREASE should be removed. This would aid the operator in controlling the direction and rate of slew and properly identify the function of the control knobs.

(5) A separate pre-heat circuit and switch should be added for the light source coolant. This feature, similar to the [redacted]940 Split Format Light Table, will negate any requirement for a warm-up period.

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(6) It is recommended that viewing ports or liquid coolant level indicators be designed which can be viewed from the operator's side of the table. This feature would eliminate the inconvenience of walking around to the back of the table to view the coolant level.

(7) It is suggested that the Power ON-OFF switch indicator light and the OVER-TEMP warning light be of different colors. It is also suggested that the OVER-TEMP warning light be red to indicate corrective action is required. The Power ON-OFF indicator light should be green to indicate a normal condition.

(8) The metal guard panels, located inside and adjacent to the lower film drive motors should be fitted with a rubber or plastic bumper. This would reduce the probability of injuring the operator or damaging his clothing.

e. Table Elevation

(1) It is recommended that the motorized elevating feature be eliminated. The gear ratio for the manual handwheel elevating feature should be adjusted to a more appropriate ratio for ease in raising and lowering the table mechanically.

(2) It is recommended that the elevating mechanism be redesigned to allow lowering the table an additional two inches below the minimum elevation of the present system. This will

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accommodate persons of less than average height who are finding it difficult to view through the microscope eyepieces.

[redacted]

Chief, Imagery Exploitation Group,
NPIC

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